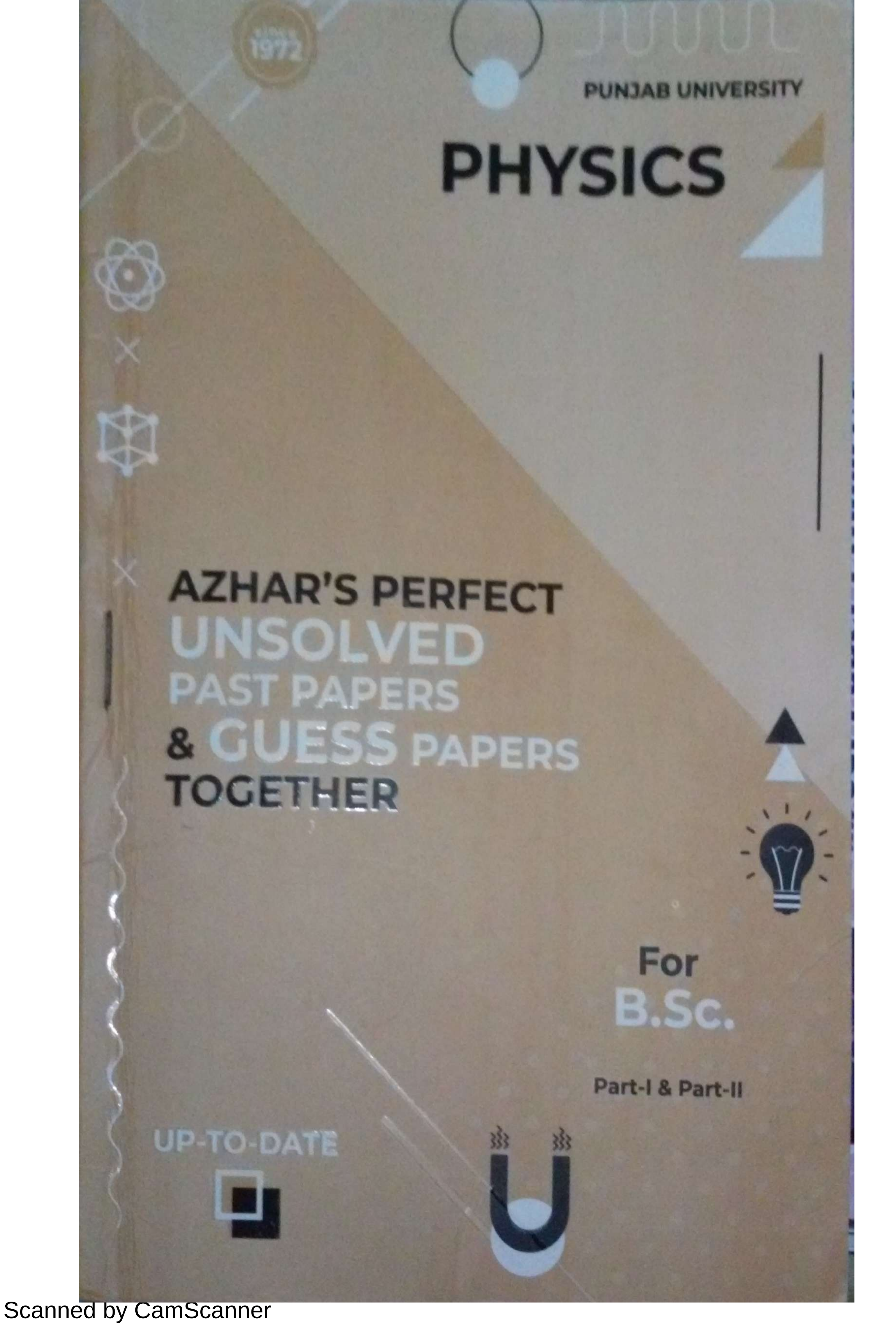

SINCE 1972
PUNJAB UNIVERSITY
PHYSICS
AZHAR'S PERFECT
UNSOLVED
PAST PAPERS
& GUESS PAPERS
TOGETHER
For
B.Sc.
Part-I & Part-II
UP-TO-DATE

Punjab University	B.Sc-2015	Time Allowed: 3Hrs.
Physics	PAPER: A	Max.Marks:50

Note: Attempt FIVE questions in all. Selecting at least TWO questions from each section.

Section-I

Q.1 a) Define vector field. If a vector field is represented by a point function $\vec{V}$ then prove that, div $\vec{V} = \frac{\partial V_x}{\partial x} + \frac{\partial V_y}{\partial y} + \frac{\partial V_z}{\partial z}$. Also show div $\vec{V} = \vec{\nabla} . \vec{V}$.

b) If

$\vec{A} = \frac{x\hat{i} + y\hat{j}}{x^2 + y^2}$, Find the value of div $\vec{A}$

Q.2 a) Derive kinetic equations, x (t) and v(t) using integration. Explain with example that how forces depend on velocity and position.

b) A car is moving at 105 km/h. The driver suddenly begins to apply the brakes, but does so with increasing force, so that deceleration increases with time according to a(t) = c(t), where $c = -2.67\ m/s^3$. [(a) How much time passes before the car comes to rest? [(b) How far does it travel in the process?

Q.3 a) State and prove parallel axis theorem. (5)

b) Find the rotational inertia of hollow cylinder of thin thickness about a cylinder axis. (5)

Q.4 a) Prove that a uniformly distributed spherical shell of matter attracts other particles outside it, as if its mass was concentrated at its center. (7)

b) Show that on a hypothetical planet having half the diameter of the Earth but twice its density, the acceleration of the free fall is the same as on the Earth. (3)

Q.5 a) What are Lorentz transformation equations? Discuss the two consequences of the Lorentz transformation equations. (1+3+3)

b) In inertial frame S, a red light and a blue light are separated by a distance $\Delta x = 2.45$ km with the red light at the larger value of x. The blue light flashes, and 5.35 μs later the red light flashes. Frame S' is moving in the direction of increasing x with a speed of u=0.855c. What is the distance between the two flashes and the time between them as

measured in S'?

Q.6. Write Note on any two of the following:

(i) One dimensional Conservative system

(ii) Work-energy theorem

(iii) Applications of Bernoulli's equation

Section-II

Q.7. a) Show that motion of a mass-spring system is simple harmonic. Derive the equation of motion and solution of mass-spring system. Also deduce the formula for angular frequency of mass-spring system. (2+2+2)

b) A period of disk of radius 10.2 cm executing small oscillation about a pivot at its rim is measured to be 0.784 s. Find the value of g, the acceleration due to gravity at that location. (3)

Q.8. a) What is the interferometer? Describe the construction and working of Michelson's interferometer. What is the role of compensating plate in the interferometer? Give three uses of Michelson's interferometer. (1+4+1+1)

b) If mirror M2 in Michelson's interferometer is moved through 0.233 mm, 792 fringes are counted with a light meter. What is the wavelength of light? (3)

Q.9. a) Derive the expression for intensity in single slit diffraction at any point by phasor treatment. Deduce the equations for maximum and minimum intensities of diffraction pattern. (3+5)

b) Monochromatic light of wavelength 441 nm falls on narrow slits. On a screen 2.16 m away, the distance between second minimum and central maxima is 1.62 cm. (3)
Calculate the angle of diffraction θ of the second minima. Also find the width of the slit.

Q.10. Write note on any TWO of the following: (5+5)

i) X-ray diffraction

ii) Power and intensity in wave motion

iii) Doppler's effect

Punjab University	**B.Sc-2015**	**Time Allowed: 3Hrs.**
Physics	**PAPER: B**	**Max. Marks:50**

Attempt FIVE questions in all, selecting ONE question from Section-I and FOUR questions from Section-II.

Section-I

Q1. a) Derive an expression for work done on ideal gas during adiabatic process?

(5,3,2)

b) A gas is suddenly compressed to one foruth of its original volume. Calculate rise in temperature.
(Original temperature is $27^{\circ}C$ and $\gamma=1.5$)

c) If the pressure and volume of a system is given. Is temperature always uniquely determined ?

Q2 a) What is **principal of refrigerator**? Calculate the coefficient of its **performance**. Is a perfect refrigerator possible? Explain.

b) A household refrigerator, whose coefficient of performance is 4.7, extracts heat from the cooling chamber at rate of 250J per second. How much work per cycle is required to operate the refrigerator? (5,3,2)

c) Can we calculate work done during irreversible process in terms of area on **PV** diagram ?

Section-II

Q3 a) State Gauss's law and prove its equivalence for **surface** and **volume distribution** of charge? (5,3,2)

b) The net electric flux through face of a dice has magnitude in units of $10^3 N\text{-}m^2/C$ equal to number 'N' spots on face (1 through 6). The flux inward for **'N'** odd and outward for even. What is the net charge inside?

c) State the situation in which potential differecne of a charged body inverse its sign of polarity?

Q4 a) Define **capacitor**. Find the **capacitance** of **cylindrical capacitor**. (5,3,2)

b) The anode and cathode of a vacuum tube in form of two cylinders and diameter of cathode is 1.62mm and anode diameter is 18.3mm with both elements having length of 2.38 cm. Calculate capacitance of diode.

c) What happens to the capacitance of simple capacitor when potential across the capacitor is increased twice?

Q5 a) What are the properties of magnetic force that effect the trajectory of particle. Derive an expression to calculate frequency of revolution of charged particle moving with velocity 'V' and perpendicular to the magnetic field 'B'?

b) An electron is accelerated from rest by a potential difference of 350V, then enters a uniform magnetic field of magnitude 200 mT. Find the speed of electron.

c) A conductor even though carrying a current has zero net charge, then why does a magnetic field exert a force on it.

Q6. a) Two long parallel wires carrying current 'i_1' and 'i_2' separated by distance 'd' are lying in magnetic field of each other. Find the magnitude of magnetic force experienced by each other. (5,3,2)

b) Two long parallel wires are 8.10 cm apart, what equal current must flow in the wires if the magnetic field halfway between them is 29 μT?

c) A steady longitudinal uniform current is setup in a long copper tube. Is there a magnetic field inside or outside the tube?

Q7. a) State and express mathematically the **Faraday's law** of electromagnetic induction for a coil of 'N' turns and explain the significance of negative sign? (5,3,2)

b) A square wire loop with 2.3 **m** side is perpendicular to uniform magnetic field **'B'** Find the induced emf in loop, when field varies by half the loop with time according to B=(0.42 - 0.87t)T?

c) Can an induced current ever establish a magnetic field 'B', that is in the same direction as the magnetic inducing the current? Justify your answer.

Q8. a) Discuss the **growth** of current in **RL** series circuit connected to a battery and hence define time constant of circuit. (5,3,2)

b) A 50V potential difference is suddenly applied to coil of 55mH and R=150 Ω at what rate is current increasing after 1.20 ms?

c) Does the time required for the current in LR circuit to build up to a given fraction of its equilibrium value depend upon the value of applied constant emf?

Q9. a) Discuss the **process** of generation of electromagnetic waves. How Maxwell equation lead towards the existence of electromagnetic waves? (5,3,2)

b) An operating laser can provide 100 Tw in 1.0 ns at a wavelength of 0.26 μm. How much energy is contained in a single pulse?

c) We associate energy and linear momentum with electromagnetic waves. Is angular momentum also present?

Q10. Write note on any two: (5,5)

i) Entropy and Second law of thermodynamics.
ii) Quantization and conservation of charge.
iii) Lorentz force and its application.
iv) Magnetic moments.

Punjab University	B.Sc-2015	Time Allowed: 3Hrs.
Physics	PAPER: C	Max.Marks:50

Note: Attempt FIVE questions, selecting at least ONE question from Section-I, and THREE questions from Section-II. All questions carry equal marks.

SECTION-I

Q1: (a) Explain that how the energy bands are formed in a solid? Discuss the valence band, conduction band and energy gap. Distinguish between conductor and semiconductor in the light of energy band theory. (3+3+3)

(b) What is the effect of temperature on the resistivity of a semiconductor? (1)

Q2: (a) What is meant by NPN and PNP transistor? Draw their symbols. (1+1)

b) Discuss the characteristics of a transistor in common emitter configuration. How the hybrid parameters are determined for these characteristic curves? (4+4)

Q3: What is an astable multivibrator? Explain its construction, working and generation of square waves. Give at least its two uses. (1+2+4+2+1)

SECTION-II

Q4: (a) What is the Compton effect? Describe the experimental arrangement and derive the relation for Compton's shift. What are the circumstances for which Compton's shift is maximum? (1+4+2)

b) A particular x-rays has a wavelength of 4.16 pm. Calculate the photon energy and momentum. (3)

Q5: (a) What is a wave function? Write down the time-independent Schrodinger wave equation. (1+1)

b) Apply the Schrodinger wave equation to find the wave functions for the specific case of step potential, when the energy of particle is less than the energy of step potential. Show that in this specific case the results of quantum theory are different than classical theory. (8)

Q6: (a) State and explain the correspondence principle. What is its limitation? (2+3+2)

(b) The wavelength of the yellow spectral emission line of sodium is 589 nm. At what kinetic energy would an electron have the same de' Broglie wavelength? (3)

Q7: (a) Write down the basic postultes of the Bohr's theory (3)

(b) Apply the Bohr's postulates on the hydrogen atom to find the radii of electron and corresponding energies of these orbital quantum states. (4)

Q8: (a) State the Moseley law. How it can be proved approximately by using the Bohr's theory? (1+5)

(b) On what quantum number does the energy of an electron in hydrogen atom depend? (1)

(c) What is the minimum potential difference across the x-ray tube that will produce a ray with a wavelength of 0.12 nm.

Q9: (a) What is the fusion reaction? Explain the thermonuclear fusion reaction occurring in sun. Find the energy released in a proton-proton cycle. (1+4+2)

(b) Why the energy released in a fusion reaction is greater than in fission reaction. (1)

(c) Show that energy released when three alpha particles fuse to from

$^{12}_{6}C$ is 7.2 Mev the atomic mass of $^{12}_{6}C$ is 12.000000 U and of $^{4}_{2}He$ is 4.002603 U. (3)

Q10: Write a detailed note on photoelectric effect on experimental grounds. (10)

Physics	B.Sc.Punjab	Paper: A
Time: 3 hrs.	University 2016	Marks = 50

NOTE: Attempt any FIVE questions in all. Selecting at least TWO questions from each section.

Section-I

Q.1. a) Explain the vector triple product and show that 2+4

$\vec{A}\times(\vec{B}\times\vec{C})=(\vec{A}.\vec{C})\vec{B}-(\vec{A}.\vec{C})\vec{C}$

b) The sum and difference of two vectors are perpendicular to each other. Prove that their magnitudes are equal. 4

Q.2. a) Calculate the work done by a variable force in one dimension. Explain it with an example on horizontal mass-spring system. 4+3

b) The spring of spring gun is compressed a distance d = 3.22 cm from its relaxed state and a ball of mass m = 12 g is put in the barrel. With what speed will the ball leave the barrel once the gun is fired

The spring constant is 750 N/m. 3

Q.3. a) Define rotational inertia of a rotating body and find the rotational inertia of a solid rod about an axis through the center and perpendicular to its length. 1+6

b) A yo-yo of mass M = 0.023 kg consisting of two discs of radius R = 2.6 cm connected by a shaft of radius 0.3 cm is spinning at the end of a string of length L = 0.84 m with angular speed ω_0. What angular velocity is needed for the yo-yo to climb up the string? Assume the string to be of negligible thickness. 3

Q.4. a) What is Poiseuille's law? Derive its mathematical expression for the fluid flow through cylindrical pipes. 1+6

b) Find the total pressure in Pascal, 118m below the surface of the ocean. Density of the sea water is 1.024 g/ cm^3 and atmospheric pressure at sea level is 1.013×10^5 Pa. 3

Q.5. a) State basic postulates of Special theory of relativity.

Explain relativity of

i) Length ii) Time 1+3+3

b) What is the kinetic energy of a proton moving at a speed of v = 0.86c? The rest mass of proton is 1.67×10^{-27}kg. 3

Q.6. Write note on any TWO of the followings. 5+5

i. Conical Pendulum

ii. Conservative and non-conservative forces

iii. Escape velocity

(Section-II)

Q.7. a) What is torsional oscillator? Prove that its motion is simple harmonic and find its time period. 1+2+3

b) The period of disk of radius 10.2 cm executing small oscillations about a pivot at its rim is measured to be 0.784 s. Find the value of g at that location. 4

Q.8. a) What is Michelson's interferometer? Describe its principle, construction and working. 1+1+2+3

b) If a mirror M in an interferometer is moved through

a 0.233 mm, 792 fringes are counted with a light meter. What is the wavelength of the light? 3

Q.9. a) What is diffraction grating? Discuss about dispersion and resolving power of a diffraction grating. 1+3+3

b) A grating has 40,000 rulings spread over 76 mm. (i) What is its expected dispersion D in degree/ nm for sodium light of wavelength 589 nm in the first order, (ii) What is its resolving power in the first order? 3

Q.10. Write note on any TWO of the followings 5+5

i) Doppler's Effect ii) Holography

iii) Travelling waves

Physics	B.Sc.Punjab	Paper: B
Time: 3 hrs.	University 2016	Marks = 50

NOTE: Attempt FIVE questions in all, selecting ONE question from Section-I and FOUR questions from Section-II.

SECTION-I
(Thermodynamics)

Q.1. a) State first law of thermodynamics and apply it to prove PV^γ = constant for an adiabatic process.

b) Calculate the rate at which heat would be lost on a very cold winter day through a 6.2 m × 3.8 m brick wall 32 cm thick. The inside temperature is 26°C and outside temperature is -18°C, assume the thermal conductivity of the brick is 0.74 W/m-K.

c) Why does the heat energy supplied to melt the ice not increase the temperature? (5,3,2)

Q.2. a) Define entropy and derive an expression for the change in entropy in a reversible process.

(b) An ideal gas undergoes a reversible isothermal expansion at 132°C. The entropy of gas increases by 46.2 J/K. How much heat was absorbed?

(c) Are there any natural processes that are reversible? (5,3,2)

SECTION-II
(Electricity & Magnetism)

Q.3. a) State Gauss's law and apply it to find electric field

near an infinite sheet of charge.

(b) A point charge of 1.84 μC is at the centre of a cubical Gaussian surface 55 cm on edge. Find the flux through the surface?

(c) A surface encloses two equal and opposite charges. What can you say about electric flux through the surface? (5,3,2)

Q.4. a) What is electric dipole? Calculate electric potential due to dipole at a point having distance r.

(b) A charge of 15.0 nC can be produced by simple rubbing. To what potential would such a charge raise an isolated conducting sphere of 16 cm radius?

(c) How would you compare a proton volt with an electron volt? The mass of proton is 1840 times that of an electron? (5,3,2)

Q.5. a) What is dielectric? Show that dielectric medium inserted between capacitor plates increases the capacitance of the capacitor.

(b) A 108 pF Capacitor is charged to potential difference of 52.4 V. The charging battery then being disconnected. The charged capacitor is connected in parallel with second initially uncharged capacitor. The measured potential difference drops to 35.8 V. Find the capacitance of second capacitor.

(c) What kind of energy is stored in the capacitor? (5,3,2)

Q.6. a) Discuss the decay of charge in an RC series circuit. Also define capacitive time constant and find expression for current.

(b) A capacitor discharges through resistor R. After how many time constant does its charge fall to one half of its initial value?

(c) Why the resistance of voltmeter should be very large as compared to the resistance across which the potential difference is to be measured? (5,3,2)

Q.7. a) State and explain Ampere's law. Write its integral and differential forms.

(b) An electron circulates around the nucleus in path of radius 5.29×10^{-11}m at frequency 6.6×10^{15} Hz. What is the value of B at the centre of orbit?

(c) In electronics, wires that carry equal and opposite currents are often twisted together to reduce their magnetic effect at distant points. Why is this effective? (5,3,2)

Q.8. a) What is solenoid? Calculate the inductance per unit length of an air cored solenoid of length l and having 'n' turns per unit length.

(b) A solenoid has an inductance of 12 μH carries a steady current of 3.8 A. The current is reduced at a constant rate in time of 15 s. What is the resulting emf developed by the solenoid?

(c) How will you calculate time constant of (i) RC series circuit (ii) RL series circuit? (5,3,2)

Q.9. a) Derive an expression for resonance frequency in an RLC series circuit when a sinusoidal voltage is applied to it. Also find the current in an RLC circuit at resonance.

(b) In an RLC series circuit, R=100Ω, C=15μF, L=200mH and f=60Hz. Find the impedance of the circuit.

(c) What is the relation between AC voltage and AC current through resistor, capacitor and inductor? (5,3,2)

Q.10. Write notes on any two of the following: (5,5)

a) Transformer (b) Ferromagnetism & hysteresis

c) Electromagnetic Spectrum

(d) Mechanism of heat transfer

Physics	B.Sc.Punjab University 2016	Paper: C
Time: 3 hrs.		Marks = 50

NOTE: Attempt FIVE questions, selecting TWO questions from Section – I, at least ONE question from each Section – II and Section – III.

SECTION-I

Q.1. a) Draw the circuit diagram for common emitter configuration. Find the relation for its out put voltage. Draw the load line and explain the function of quiescent point on the line. 1 +2+5

(b) Express the current gain of a transistor in common

emitter in terms of common base. 2

Q.2 a) Explain the transistor as an amplifier in common base. 7

(b) The current flowing into the base of a transistor is 50 μA. Find its collector current I_C and I_E, if the value of current gain β is 100. 3

Q.3 a) (a) What is a NOR-gate. Write down its Boolean expression and truth table. Explain and verify the truth table by a diode transistor logic (DTL) circuit. 1+1+1+5

(b) What is the effect of a temperature on the conductivity of a conductor and semiconductor. 2

SECTION-II

Q.4 a) What is a compton's effect? Find the relation for the wavelength of scattered x-ray after interaction with electron at rest. Show that compton's shift varies with the scattering angle. 1+4+1

(b) Is the compton's effect supportive of the photon theory of light. 1

(c) A particular x-ray photon has wavelength of 41.6pm, calculate the photon's momentum. 3

Q.5 a) What do you understand by the matter waves? Expalin that how the de'Broglie's Hypothesis was tested by Davison and Germer? 1+5

(b) Does a photon have a de'Broglie wavelength? Explain. 1

(c) Calculate the de'Broglie wavelength of an electron whose kinetic energy is 120 eV 3

Q.6 What is the physical significance of Schrodinger's equation? Write the time independent and time dependent Schrodinger's equation, apply this equation to find the energy and momentum of a free particle. 1+1+1+3½+3½

SECTION-III

Q.7 a) What is the difference between ionization and excitation potential? Explain that how did the Franck Hertz prove the Bohr's theory of discrete energy levels of electron in an atom? 1+1+5

(b) Calculate the longest wavelength of a line in

Paschen's spectrum. 3

Q.8. a) State the Moseley law and derive the Moseley relation using the Bohr's atomic model. 6

(b) Why do you expect the wavelength of radiations generated by transition deep within the atom to be shorter than those generated by transitions occurring in the outer fringes of the atom? 1

(c) If a uranium nucleus (Z=92) had only a single electron, what should be the radius of its ground state orbit according to Bohr's theory. 3

Q.9. a) What is the radioactive decay law and half life of a radioactive substance? How the half life is determined? 1+1+5

(b) The decay constant of I is 0.0271 min^{-1}, find its half life. 3

Q.10. Write a detailed note on the basic process of nuclear fission. 10

Physics-I	B.SC Punjab University 2016	Paper: A
Time: 3 Hrs	Part-I	Max. Marks: 75

Note: Attempt any FIVE questions, selecting not more than TWO questions from each section.

Section - I

Q1. (a) Define Divergence of a vector field and show that div $\vec{V} = \nabla.\vec{V}$ (7)

(b) What do you mean by surface integral and line integral? (5)

(c) Show that if a vector is gradient of a scalar function, then its line integral around a closed path is equal to zero. (3)

Q2. (a) Define work and power. Show that work done by an arbitrary applied force is equal to the change in kinetic energy of the body. (8)

(b) Does kinetic energy depend upon the direction of motion of the body? Can it be negative? (3)

(c) A 106 kg object is initially moving in a straight line with a speed 51.3 m/s. If it is brought to a stop with a deceleration of 1.97 m/s^2, what force is required, what distance does the object travel and how much work is done by the force? (4)

Q3. (a) What is meant by fictitious force? Explain your answer by giving examples. (8)

(b) In the conical pendulum, what happens to the period and the speed when $\theta = 90^\circ$. Why is this angle not achievable physically? Discuss the case for $\theta = 0^\circ$. (3)

(c) Give brief description of the working of the device Rotor. (4)

Q4. (a) Discuss Einstein Postulates of Special Theory of Relativity. (5)

(b) Derive the Einstein mass-energy equivalence $E = mc^2$ and illustrate its importance in physics. (8+2)

Section - II

Q5. (a) What do you mean by Interference of light and Coherent sources? (7)

(b) Discuss the analytical treatment of the Young's double slit interference. (8)

Q6. (a) What is a Damped Harmonic Oscillator? Derive equation of motion for damped harmonic oscillator. Find the expressions for displacement, frequency and amplitude.

(b) Why are damping devices often used on machinery? Give an example.

(c) An oscillator consists of a block of mass 512 g connected to spring. When set into oscillations with an amplitude of 34.7 cm, it is observed to repeat its motion every 0.484 s. Find its frequency and maximum speed.

Q7. (a) Give construction and theory of Diffraction Grating. Also derive an expression for its resolving power. (8)

(b) Give a comparison of prism spectrum and grating spectrum. (3)

(c) A grating has 315 lines/mm. For what wavelengths in the visible spectrum can fifth order diffraction be observed? (4)

Section - III

Q8. (a) Clearly differentiate between a Heat Engine and a refrigerator. (5)

(b) Give two statements of Second Law of Thermodynamics and show that they are equivalent. (8)

(c) Is human being a heat engine? Explain. (2)

Q9. (a) Explain the Maxwell law of distribution of molecular

velocities for the molecules of a gas. (8)

(b) What do you mean by Internal energy of an Ideal gas? Derive an expression for it using Maxwell Boltzmann's energy distribution. (7)

Q10. (a) What is entropy? Derive the relation for the change in entropy during a reversible process. (8)

(b) Comment on the following statement, "A heat engine converts a disordered motion of heat into an organized motion of heat". (3)

(c) Give a brief description of the Thermodynamic Scale of Temperature. Define One Kelvin.

Physics-I	**B.Sc.Punjab University 2017**	**Part – I Paper: A**
Time: 3 hrs.		**Marks = 75**

NOTE: Attempt FIVE questions, selecting not more than TWO questions from each section.

Section-I

Q.1. a) Define Gradient of a scalar field and show that $GradS = \nabla S$ (7)

b) If Φ is a scalar function, prove that Curl (Grad Φ)=0 (5)

c) What do you mean by Direction Cosines of a vector? (3)

Q.2. a) Give a description of Conical Pendulum. Derive expression for its time period of revolution and mention its uses (8)

b) A conical pendulum is formed by attaching a 53 g pebble to a 1.4 m string. The pebble swings in a circle of radius 25 cm.

(i) What is the speed and acceleration of pebble? (3)

(ii) What is tension in the string? (4)

Q.3. a) Define conservative field. Show that in a conservative field, work done along a closed path is equal to zero. (8)

b) A swinging pendulum eventually comes to rest. Is this a violation of law of conservation of energy? (3)

c) A ball of mass 52.4 g is thrown from the ground into the air with an initial velocity of 16.3 m/s at an angle of 27.4° with the horizontal. What are the values of

its kinetic energy initially and just before it strikes the ground? (4)

Q.4. a) Discuss the consequences of Lorentz Transformation for
(i) the relativity of length and
(ii) the relativity of time (10)

b) Comment on the following statement, "the relation $E=mc^2$ is essential to the operation of power plant based on nuclear fission" (2)

c) An electron has a speed of 0.990 c (where c is velocity of light). What is the K.E of electron? (3)

Section - II

Q.5. a) What do you mean by torsional oscillator? Show that its motion is simple harmonic motion. Derive an expression for its time period. (8)

b) An oscillating block - spring system has a mechanical energy of 1.18 J, amplitude of 9.84 cm and maximum speed of 1.22 m/s. Find
(i) spring constant of spring (ii) Mass of block
(iii) frequency of oscillation (5)

c) Give graphical representation of simple harmonic motion. (2)

Q.6. a) Give a detailed description of Young's Double Slit Experiment. Find an expression for fringe spacing for bright and dark fringes. (8)

b) Why central spot of Newton's rings appears dark? (3)

c) A double slit experiment is performed with a light of wavelength 512 nm. The slits are 1.4 mm apart and screen is 3.4 meter from the double slits. Find the fringe width of the bright fringes as observed on the screen. (4)

Q.7. a) What is diffraction of light? Clearly differentiate between Fresnel and Fraunhoffer type of diffraction. (4)

b) Drive the conditions for maxima and minima of diffraction due to double slit. (8)

c) A slit of width d is illuminated by visible light. Calculate the value of d for which the first order minima of red light of wavelength 650 nm fall at $\theta = 15°$ (3)

Section - III

Q.8. a) Give two statements of second law of thermodynamics. (5)

b) Drive an expression for the efficiency of a Carnot's reversible heat engine. (8)

c) What are thermodynamic functions? Give examples. (2)

Q.9. a) What do you mean by isothermal and adiabatic processes? (6)

b) State and explain clausius theorem and drive the definition of entropy. (7)

c) Explain the principle of increase of entropy. (2)

Q.10. a) Deduce an expression for viscosity of a gas in terms of mean free path on the basis of kinetic molecular theory of gases. Show that viscosity is independent of pressure but depends upon temperature of gas. (10)

b) What do you mean by mean free path of gas. Drive ar. expression for it. (5)

Physics-II	B.Sc.Punjab University 2017	Part – II Paper: A
Time: 3 hrs.		Marks = 75

NOTE: Attempt any Five Questions, selecting not more than Two questions from each section.

Section-I

Q.1. a) Derive the expression for electric field at any point from the ring of charge along its central axis. 10

b) A plastic rod whose length is 220 cm and radius is 3.6 mm, carries a negative charge of magnitude 3.8×10^{-7} C, spread uniformly over its surface. What is the electric field near the midpoint of the rod, at a point on its surface? 3

c) Electric lines of force never cross, why. 2

Q.2. a) Discuss the growth of charge on capacitor in RC series circuit connected with battery. Also find the value of current RC series circuit. 8,2

b) In an RC series circuit ε = 11V, R=1.42 MΩ and

capacitor C = 1.80 μF (a) Calculate the time constant (b) Find the maximum charge that will appear on the capacitor during the charging, (c) How long does it take for charge to build up to 15.5 μF C. 3

c) What is the difference between emf and potential difference? 2

Q.3. a) Using Biot-Savart law, derive the formula for the magnitude of magnetic field due to circular loop of current at any point on the axis of loop. 10

b) A solenoid has the length 1.23 m and an inner diameter 3.55 cm. It has five layers of winding of 850 turns each and carries a current 5.57 A. What is B at its center? 3

c) Discuss the analogies and differences between Amperes law and Gauss's law. 2

Q.4. a) When a rectangular conducting loop of width D is moved inside a uniform magnetic field, pointing normal to the plane of loop. Compute the rate at which energy is dissipated in the loop. 10

b) A circular UF television antenna has diameter of 11.2 cm. The magnetic field of TV signal is normal to the plane of the loop, and at one instant of time, its magnitude is changing at the rate of 157 mT/s. The field is uniform. Find the emf in antenna. 3

c) In Faraday's law of induction, does induced emf depend on the resistance of the circuit. If so, how. 2

Section – II

Q.5. a) Define Compton Effect. In photon-electron collision, show that Compton shift depends on scattering angle of photon. 1,9

b) X rays with λ =100 pm are scattered from the carbon target. The scattered radiation is viewed at 90° to the incident beam. What is Compton Shift? 3

c) In both photoelectric effect and Compton effect, there is an incident photon and an ejected electron. What is the difference between these two effects? 2

Q.6. a) What is the purpose of Stem-Gerlach experiment? Using Stem-Gerlach experiment show that net force on dipole depends on gradient. Also describe the

experimental results of Stem-Gerlach experiment 1,7,2

b) Explain briefly the Zeeman Effect 5

Q.7. a) What is thermonuclear fusion? Describe three main problems in controlled thermonuclear fusion. 1,7

b) Explain Proton-Proton cycle for energy production in stars, give mathematical steps as well. 5

c) Describe very briefly the Lawson's criterion for successful operation of thermonuclear reactor. 2

Section - III

Q.8. a) What are N and P type semiconductor materials. How depletion region is created in the PN junction. Analyze the revere bias characteristics of PN diode by giving graph. What happens to PN diode at reverse breakdown voltage? 1,2,4,1

b) Explain the operation of bridge rectifier circuit. Give the answer by giving path of current in bridge rectifier circuit. 7

Q.9. a) Describe the basic structure and operation of NPN transistor. 2,6

b) Draw the circuit for common emitter transistor configuration and describe any two of its characteristics. 7

Q.10. a) Discuss the working of an Astable Multivibrator. Also give its three uses. 8,2

b) What is AND gate, give its symbol, Boolean equation and truth table. Explain the function of AND gate by using suitable PN diode circuit. 2,3

Punjab University	B.Sc 2018	Time Allowed: 3 hrs
Paper A: Physics-I	Part-I	Max Marks: 75

Note: Attempt FIVE questions, selecting not more than TWO questions from each section.

Q1. (a) Define the divergence of a vector field and show that div $\overline{V} = \overline{\nabla}.\overline{V}$. (8)

(b) If $\phi(x,y,z) = 3x^2y - y^3z$ find grade ϕ at the point $(1_1 - 2_1 1)$. (5)

(c) Define gradient of a scalar field. (2)

Q2. (a) What is rotor. Find a relation for tangential velocity to prevent slipping. Discuss how this velocity depletes on different parameters. (8)

(b) Consider a rotor of radius 2m. It is given that coefficient of fiction between material of clothing and rotor wall is 0.40. Find speed of object, time period and frequency of rotor. (5)

(c) What is pseudo force? (8)

Q3. (a) What is work. How work done is found by a variable force.

(b) A running man has kinetic energy that a boy of half of his mass. The man speeds up by 1m/s and then has same kinetic energy as the boy. What is original speed of the man. (5)

(c) Suppose that the earth revolves around Sun is a perfectly circular orbit. Does sun do any work on the earth? (2)

Q4. (a) State and explain the law of periods of planets? (8)

(b) What minimum initial speed must a projectile have at surface of earth if it is to escape the earth? Ignore effects of friction and rotation of earth. (8)

(c) Why acceleration due to gravity near polar region is greater than that at equatorial? (2)

Section-II

Q5. (a) What is simple pendulum? Derive a relation for its

time period. (8)

(b) Consider a block-spring system in which spring constant of spring is 221 N/m and mass of block is 2.43kg. The block is stretched in the x-direction a distance of 11.6cm from equilibrium and released. What is total energy in the system? (5)

(c) It is possible to have damped oscillations when a system is at resonance? (2)

Q6. (a) Explain how electromagnetic waves are added by phasor method. (8)

(b) Monochromatic green light of wave length 554nm illuminates two parallel narrow slits um apart. Calculate the angular position of third order fringe in radians. (5)

(c) In Young double slit experiment, if distance between the slits is halved and distance between slit and screen is double, then find change in fringe width. (2)

Q7. (a) What is diffraction grating. Derive and explain its equation. (8)

(b) Slit of width d is illuminated by white light. For what value of d does the first minimum for light of 650mm fall at $\theta = 15$? (5)

(c) How will the sky appear if there had been no atmosphere? (2)

Section-III

Q8. (a) On the basis of kinetic theory of gases, derive a relation for pressure of gas. (8)

(b) Find root means square speed of Hydrogen gas at S.T.P, assuming it to be an ideal gas. ($\rho = 8.99 \times 10^{-2}$ kg/m^3) (5)

(c) Is it possible to get a diffraction pattern due to a wide slit? (2)

Q9. (a) Discuss distribution of molecular speeds in detail, of an ideal gas. (8)

(b) Find average translational kinetic energy of individual nitrogen molecules at 1327°C in eV. (5)

(c) The speeds of group of ten particles as follows: two particles are moving 500m/s, four are moving at 200 m/s and four are moving at 600 m/s. Calculate V_{rms}.(2)

Q10. (a) What is first law of thermodynamics? Also discuss its physical significance and limitation of this law. (8)

(b) In an experiment 1.35 mole of oxygen are heated at constant pressure starting at 284K. How much heat must be added to the gas to double its temperature?(5)

(c) Can heat be added to a system without causing temperature of the substance to rise? (2)

Punjab University	B.Sc 2018	Time Allowed: 3 hrs
Paper A: Physics-II	Part-II	Max Marks: 75

Note: Attempt FIVE questions, selecting not more than TWO questions from each section.

Section-I

Q1. (a) Define current density. Compute the drift speed of the charge caries in a conductor by using the current density. (10)

(b) A potential difference V is applied across a cylindrical conductor of length L and uniform cross sectional area A, establishing current i. Determine the resistivity and resistance of the conductor. (3)

(c) Why do electric power companies reduce voltage during times of heavy demand? (2)

Q2. (a) Derive the expression for the torque on current carrying loop when placed inside the uniform magnetic field. Also describe the direction of torque. (10)

(b) A coil 2.1 cm high and 1.2 cm wide has 250 turns and carries a current of 85 μA. What is the magnitude of magnetic dipole moment of the coil? (3)

(c) If an electron is not deflected in passing through a certain space, can we be sure that there is no magnetic field in that region? (2)

Q3. (a) Derive the expression for electric field at any point from the infinite line of charge, having uniform charge density. (10)

(b) Electric lines of force never cross, why. (2)

(c) A plastic rod whose length is 220cm and radius is 3.6mm, carries a negative of charge magnitude 3.8×10^{-7}C, spread uniformly over its surface. What is the electric field near the midpoint of the rod, at a point on its surface? (3)

Q4. (a) What is electromagnetic oscillator? Derive the expression for the frequency of oscillation of a LC circuit. (1, 9)

(b) A circuit has L = 12 mH, C= 1.6 μF and R = 1.5Ω. After what time t will the amplitude of charge oscillations drop to one-half of its initial value? (3)

(c) What is difference between free, damped and forced oscillator. (2)

Section-II

Q5. (a) What is photoelectric effect? Explain three major features of photoelectric effect that cannot be explained on the basis of classical wave theory of light. (1, 9)

(b) What is photon? Explain Einstein's photo concept of photo electric effect. (5)

Q6. (a) State Bohr's postulates. Using Bohr's model of hydrogen atoms, derive the expression for total mechanical energy of electron orbiting about central proton. (2, 8)

(b) Calculate the value of Bohr radius. The values to be uses; $h = 6.626 \times 10^{-34}$J.s, $\varepsilon_0 = 8.854 \times 10^{-12}$ F/m, $m = 9.109 \times 10^{-31}$ kg, $e = 1.602 \times 10^{-19}$C. (3)

(c) What is difference between characteristics x rays and continuous x-rays? (2)

Q7. (a) Show that th law of radioactivity obeys the exponential law. What is half-life of radioactive element. Deduce a relation between half-life and disintegration constant. (6,1,3)

(b) Find the energy released during the alpha decay of ^{238}U. The needed atomic masses are ^{238}U=238.050783, ^{4}He=4.002603u, ^{234}Th=234.043596u. (3)

(c) In what ways the strong force and electrostatic force are different. (2)

Section-III

Q8. (a) Discuss with diagrams, the forward and revers characteristics of pn junction diode. Explain the effect of temperature on diode characteristics. (6,2)

(b) Explain the operation of full wave rectifier using two diodes. What are ripples, how these can be removed. (5,2)

Q9. (a) What is dc-load line? Derive and plot the load line equation for common emitter transistor configuration. Define operating point? (1,8,1)

(b) Describe the basic operation of NPN transistor.

Q10. (a) How a common emitter transistor can be used as an amplifier, give answer by suitable schematic diagrams. Why the common emitter trnasistor configuration is frequently used in amplifying circuits? (8,2)

(b) Define NOT gate with its symbol, truth table and Boolean equation. Explain how a common emitter transistor can act as NOT gate. (1,4)

Punjab University	B.A/B.Sc 2019	Time Allowed: 3 hrs
Paper A: Physics-I	Part-I	Max Marks: 75

Note: Attempt FIVE questions, selecting not more than TWO questions from each section.

Q1. (a) Define gradient of a scalar field and show that grad $S = \overline{\nabla} S$ (8)

(b) Prove that grad r = r / r (5)

(c) What is physical interpretation of scalar triple product. (2)

Q2. (a) What is a rotor? Find a relation for tangential velocity to prevent slipping. (8)

(b) Consider a rotor of radius 2m. It is given that coefficient of fiction between material of clothing and rotor wall is 0.40. Find speed of object and time period of rotor. (5)

(c) Why roads are banked in hill stations? (2)

Q3. (a) Define center of mass. Find relation for center of mass of uniform solid cylinder. (8)

(b) Show that the ratio of distances of two particles from their center of mass in inverse ratio of their masses.(5)

(c) Does the center of mass of a solid object necessarily lie within the object? If not, give example. (2)

Q4. (a) Discuss the consequences of Lorentz transformation for the relativity of length and relativity of time. (8)

(b) A spaceship of rest length 130m drifts past a timing station at a speed of 0.74c. What is the length of spaceship as measured by the timing station? (5)

(c) Some distant galaxies are moving away from us at speeds greater than 0.5c. What is speed of light received on earth from these galaxies? (2)

Section-II

Q5. (a) What is torsional oscillator? Derive a relation for its time period. (8)

(b) Consider a block-spring system in which spring constant of spring is 221 N/m and mass of block i

2.43kg. The bloci is stretched in the x-direction a distance of 11.6cm from equilibrium and released. What is total energy in the system? (5)

(c) Could we ever construct a true simple pendulum? Explain. (2)

Q6. (a) Describe Young's double slit experiment. Find expression for fringe pacing for dark and bright fringes. (8)

(b) A double slit experiment is performed with blue green light of wavelength 512nm. The slits are 1.2mm aprt and screen is 5.4m from slits. How far apart are the bright fringes a seen on screen? (5)

(c) Can interference fringes be produced by two separate lighted candles or electric bulb? Explain. (2)

Q7. (a) Discuss diffraction at single slit in detail. Find a general formula for minima. (8)

(b) Slit of width d is illuminated by white light. For what value of d does the first minimum for light of 650nm fall at $\theta = 15^o$? (5)

(c) Name various applications of polarization. (2)

Section-III

Q8. (a) What is adiabatic process. Find a relation for work done in adiabatic process. (8)

(b) A sample of gas consisting of 0.11 moles is compressed from a volume of $4m^3$ to $1m^3$, while its pressure increases from $10N/m^2$ to $40 N/m^2$. Calculate work done during isothermal process in compressing the gas. (5)

(c) How Brownian motion can be increased in a gas? (2)

Q9. (a) What is meant by internal energy of an ideal gas? Derive an expression for Maxwell Boltzmann energy distribution. (8)

(b) Calculate root mean square speed of ammonia molecules at 56°C. given that an atom of nitrogn has a mass 2.33×10^{-26} kg and that of a hydrogen atom has $1.67x10^{-27}$ kg. (5)

(c) The average speed of air molecules in a room is of the order of speed of sound. What is their average velocity? (2)

Q10. (a) What is entropy? Derive a relation for the change in entropy during a reversible process. (8)

(b) The turbine in a steam power plant takes steam from a boiler at 520°C and exhausts it into a condenser at 100°C. Find its efficiency. (5)

(c) It is true that heat energy of the universe is steadily growing less available? If so, why? (2)

Punjab University	**B.A/B.Sc 2019**	**Time Allowed: 3 hrs**
Paper A: Physics-II	**Part-II**	**Max Marks: 75**

Note: Attempt FIVE questions, selecting not more than TWO questions from each section.

Section-I

Q1. (a) Using the integration method, derive the expression for electric field at any point from a uniformly charged rod of infinite length. (10)

(b) A plastic rod whose length is 220cm and radius is 3.6mm, carries a negative charge of magnitude 3.8×10^{-7}C, spread uniformly over its surface. What is the electric rfield near the midpoint of the rod, at a point on its surface? (3)

(c) What is the origin of static cling, a phenomenon that sometimes affects clothes as they are removed from a dryer? (2)

Q2. (a) Define joule heating. Describe how energy is transferred to electric circuit. Also derive the expression for energy transfer to the resistor in an electric circuit. (1,5,4)

(b) A heating length of wire having resistance of 72Ω is to be connected across a 120V line. Under which circumstances will the wire dissipate more heat (a) Its entire length connected across the line or (b) The wire is cut in half and is connected in parallel across the

line? (3)

(c) Why do electric power companies reduce voltage during times of heavy demand? (2)

Q3. (a) Using Biot-Savart law, derive the formula for the magnitude of magnetic field due to circular loop of current at any point on the axis of loop. (10)

(b) In the Bohr model of hydrogen atom, the electron circulates around the nucleolus in a path of radius 5.29×10^{-11}m at a frequency f of 6.60×10^{15} Hz. what value of B is set up at the center of orbit? (3)

(c) Is B uniform for all the points within the circular loop of wire carrying a current, explain? (2)

Q4. (a) Define inductance. Calculate the inductance of an inductor. Also calculate the inductance of a solenoid having a length l, area of cross section A and number of turns per unit length n. (1,4,5)

(b) A solenoid has an inductance of 53mH and a resistance of 0.37Ω. If it is connected to a battery, how long will it take for the current to reach one-half its final steady state value? (3)

(c) Describe briefly the difference between self-induction and mutual induction. (2)

Section-II

Q5. (a) What is de Broglie's hypothesis, Explain, how Davisson-Gerner experimentally proved the de Brogle's hypothesis. (1,9)

(b) Calculate the de Broglie's wavelength of a dust particle of mass 1.0×10^{-9} kg moving with a speed of 2.0 cm/s. (3)

(c) Why is the Heisenberg uncertainty principle not more radially apparent in our daily observations? (2)

Q6. (a) State Bohr's postulates. Using Bohr's model of hydrogen atom, derive the expression for total mechanical energy of electron orbiting about central proton. (2,8)

(b) Calculate the binding energy of a hydrogen atom, that

is, the energy that must be added to the atom to remove the electron from its lowest energy state. The values to be used; $h = 6.63 \times 10^{-34}$ j.s, $R = 1.097 \times 10^{7}$ m^{-1}, $C = 3 \times 10^{8}$ m/s. (3)

(c) Describe briefly, the two characteristics of laser light.

Q7. (a) Explain in detail, Rutherford's gold foil experiment for discovering the atomic nucleus. (10)

(b) Calculate the binding energy of deuteron. The needed atomic masses are $m_n = 1.008665u$, $m(^1H) = 1.007825u$, $m(^2H) = 2.014102u$. (3)

(c) Explain briefly, the difference between exothermic and endothermic reactions. (2)

Section-III

Q8. (a) What is doping. How PN junction diode is formed. Explain the characteistics of PN junction diode in reverse biased mode by giving the circuit diagram and a graph. (1,1,6)

(b) What is difference between valance and conduction bands? Distinguish between insulator, semi conductor and conductor according to band theory of solids. (1,6)

Q9. (a) what is rectification? Explain how PN diode is used for half wave rectification. (1,7)

(b) Explain the input and output characteristics of common emitter transistor configuration. Give your answer with the help of schematic diagram and graphs. (7)

Q10. (a) Explain in detail, the operation of a common emitter transistor as an amplifier. Also tell why a common emitter circuit is widely used for amplification. (9,1)

(b) Define OR gate. Give its symbol, Boolean equation and truth table. Explain why NAND gate is called universal gate. (7,1)

Azhar Guess Paper B.Sc

Physics-I	Part - I

Note: Attempt FIVE questions, selecting not more than TWO questions from each section.

SECTION-I

Q1a. Define Divergence of a vector field and show that: div $\vec{V} = \nabla . \vec{V}$ (8)

b. If $\phi(x, y, z) = 3x^2 - y - y^3 z$ find grade ϕ at the point 1, -2, -1. (5)

c. Show that if a vector is gradient of a scalar function, then its line around a closed path is equal to zero. (2)

Q2a. Give a description of Conical Pendulumn. Derive expression for its time period of revolution and mention its uses. (8)

b. Does kinetic energy depend upon the direction of motion of the body? Can it be negative? (3)

c. A 106 kg object is initially moving in a straight line with a speed 51.3m/s. If it is brought to a stop with a decleration of 1.97 m/s², what force is required, what distance does the object travel and how much work is done by the force? (4)

Q3a. What is meant by fictitious force? Explain your answer by giving examples. (8)

b. A swinging pendulum, eventually comes to rest. Is this a violation of law of conservation of energy? (3)

c. A ball of mass 52.4g is thrown from the ground into the air with an initial velocity of 16.3m/s at an angle of 27.4° with the horizontal. What are the values of its kinetic energy initially and just before it strikes the ground? (4)

Q4a. Discuss the consequences of Lorentz Transformation for:

(i) the relativity of length and

(ii) the relativity of time. (8)

b. What minimum initial speed must a projectile have at surface of Earth if it is to escape the earth? Ignore effects of

friction and rotation of Earth. (5)

c. Comment on the following statement, "the relation. $E=mc^2$ is essential to the operation of power plant based on nuclear fission." (2)

SECTION-II

Q5a. What is simple pendulum? Derive a relation for its time period. (8)

b. Consider a block spring in which spring constant of spring is 221 N/m and mass of black is 2.43kg. The block is stretched in the x-direction a distance of 11.6 cm from equilibrium and released. What is total energy in the system? (5)

c. Give graphical representation of simple harmonic motion.

Q6a. Give a detailed description of Young's Double Slit. Experiment. Find an expression for fringe spacing for bright and dark fringes. (8)

b. Monochromatic green light of wave length 554 nm illuminates two parallel narrow slits 7.7um apart. Calculate the angular position of third order fringe in radians. (4)

c. An oscillator consists of a block of mass 512g connected to spring. When set into oscillations with an amplitude of 34.7cm, it is observed to repeat its motion every 0.484s. Find its frequency and maximum speed. (3)

Q7a. What is diffraction of light? Clearly differentiate between Fresnel and Fraunhoffer type of diffraction. (4)

b. Give a comparison of prism spectrum and grating spectrum. (3)

c. Derive the conditions for maxima and minima of diffraction due to double slit. (8)

SECTION-III

Q8a. Give two statements of second law of Thermodynamics and show that they are equivalent. (8)

b. Find root means square speed of Hydrogen gas at S.T.P. assuming it to be an ideal gas. $(p = 8.99 \times 10^{-2} kg/m^3)$. (5)

c. Is human being a heat engine? Explain. (2)

Q9a. Explain the Maxwell law of dist of molecular velocities for the molecules of a gas. (8)

b. What do you mean by isothermal and a diabatic processes?(5)

c. Explain the principle of increase of entropy. (2)

Q10a. Deduce an expression for viscosity of a gas in terms of mean free path on the basis of kinetic molecular theory of gases. Show that viscosity is independent of pressure but depends upon temperature of gas. (8)

b. In an experiment 1.35 mole of oxygen are heated at constant pressure starting at 284k. How much heat must be added to the gas to double its temperature. (5)

c. Give a brief description of the Thermodynamic scale of temperature. Define one Kelvin. (2)

Azhar Guess Paper B.Sc	
Physics-II	Part - II

Note: Attempt any FIVE questions, selecting not more than TWO questions from each section.

SECTION-I

Q1a. Derive the expression for electric field at any point from the ring of charge along its central axis. (10)

b. A potential difference V is applied across a cylindrical conductor of length L and uniform cross sectional area A, establishing current i. Determine the resitivity and resistance of the conductor. (3)

c. Electric lines of force never cross, why? (2)

Q2a. Derive the expression for the torque on current carrying loop when placed inside the uniform magnetic field. Also describe the direction of torque. (10)

b. A coil 2.1cm high and 1.2cm wide has 250 turns and carries a current of 85μA. What is the magnitude of magnetic dipole moment of the coil? (3)

c. What is the difference between emf and potential difference? (2)

Q3a. Using Biot-Savart law, derive the formula for the magnitude of magnetic field due to circular loop of current at any point on the axis of loop. (10)

b. A solenoid has the length 1.23m and an inner diameter 3.55cm. It has five layers of winding of 850 turns each and carries a current 5.57A. What is B at its center? (3)

c. A plastic rod whose length is 220cm and radius is 3.6mm, carries a negative of charge magnitude 3.8×10^{-7} C, spread uniformly over its surface. What is the electric field near the midpoint of the rod, at a point on its surface? (3)

Q4a. What is electromagnetic oscillator? Derive the expression for the frequency of oscillation of a LC circuit. (1,9)

b. A circular UF television antenna has diameter of 11.2cm. The magnetic field of TV signal is normal to the plane of the loop, and at one instant of time, its magnitude is changing act the rate of 157 mT/s. The field is uniform. Find the emf in antenna. (3)

c. What is difference between free, damped and forced oscillator? (2)

SECTION-II

Q5a. Define Compton Effect. In photon electron collision, show that compton shift depends on scattering angle of photon. (1,9)

b. X-rays with λ=100pm are scattered from the carbon target. The scattered radiation is viewed at 90° to the incident beam. What is Compton Shift? (3)

c. In both photoelectric effect and Compton Effect, there is an inciden photon and on ejected electron. What is the difference between these two effects? (2)

Q6a. State Bohr's postulates. Using Bohr's model of hydrogen atom, derive the expression for total mechanical energy of electron orbiting about central proton. (2,8)

b. Calculate the value of Bohr radius. The values to be used;(3)
$h = 6.626 \times 10^{-34}$ J.s.
$Eo = 8.854 \times 10^{-12}$ F/m,
$m = 9.109 \times 10^{-31}$ Kg.
$e = 1.602 \times 10^{-19}$ C.

c. What is difference between characteristics x rays and continuous x-rays. (2)

Q7a. What is the thermonuclear fusion? Describe three main problems in controlled thermonuclear fusion. (1,7)

b. Explain Proton-Proton cycle for energy production in stars, give mathematical steps as well. (3)

c. In what ways the strong force and electrostatic force are different? (2)

SECTION-III

Q8a. What are N and P type semiconductor materials. How depletion region is created in the PN junction. Analyze the reverse bias characteristics of PN diode by giving graph. What happens to PN diode at reverse breakdown voltage? (1,2,4,1)

b. Explain the operation of full wave rectifier using two diodes. What are ripples, how these can be removed. (5,2)

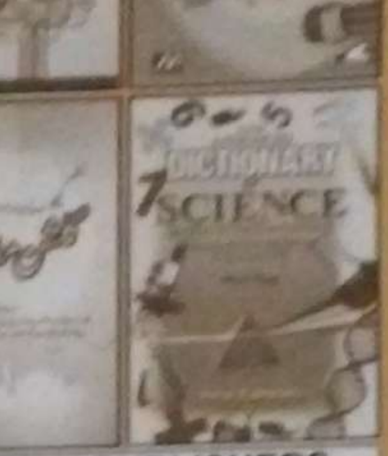
Q9a. What is dc-load line? Derive and plot the load line equation for common emitter transistor configuration. Define operating point? (1,8,1)

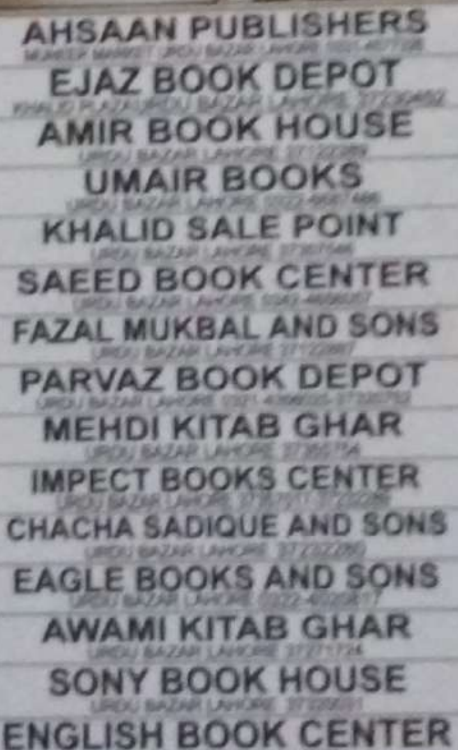
b. Draw the circuit for common emitter transistor configuration and describe any two of its characteristics. (5)

Q10a. How a common emitter transistor can be used as an amplifier, give answer by suitable schematic diagram. Why the common emitter transistor configuration is frequently used in amplifying circuits? (8,2)

b. What is AND gate, give its symbol, Boolean equation and truth table. Explain the function of AND gate by using suitable PN diode circuit? (2,3)

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